blessed aspects of the study of animate nature that there may be the alternative interpretation. Work at a problem long as you will, you will find that when you flatter yourself you have obtained the clue to its significance it will often happen that it is just that which you have missed.

Call it ambiguity if you will; it is primarily due to the structural and functional complexity of living matter, and there lies in it, to my mind, the greatest charm of our science, in that it appeals to the imagination, and therein arouses one of the highest of the intellectual faculties. We work in hope, content to investigate the reason of phenomena, but the nature of things will be ever beyond our grasp.

As contributing to the advancement of knowledge, and to a fuller understanding of the phenomena which underlie the operations of nature, the topics to which I have drawn attention are among the most important in the recent progress of science —the most revolutionary results of patient, persistent inquiry. In their definitive form, the so-called "laws of nature" are but generalised statements of fact, and, so far as we are individually concerned, I would remind you that, since we are but members of the great animal subkingdom, dependent, with the probable millions of species which compose it, upon a common set of conditions in our relations to the universe at large, it is impossible, if we would know and appreciate our position in the world, to present a deaf ear to their teaching. It behoves us not only to ponder them on our own account, but to see to it that, as time progresses, those committed to our charge are so brought up as to be not wholly ignorant of them.

And this brings me to the concluding portion of my address.

As members of local committees and scientific societies, we are pledged to the task of what is known as popular education, and its correlate the "popularisation of science." Exactly what this hackneyed expression may be taken to imply I have never yet discovered, and, speaking for myself, I regard it as erroneous. Science cannot be popularised, and any work to-day worthy the name of scientific must be technical. To popularise science is an impossibility, but to popularise the results of it is quite another thing.

Our task is educational, and we have to encourage a love of those subjects which form the basis of the doctrine of "organic evolution," from which has arisen the greatest revolution in thought and the conduct of life the world has ever seen. How heavy the responsibility we thus incur! How poor the encouragement we, for the most part, receive at the hands of our fellow citizens! To the credit of our nation, be it said, the State is now alive to its responsibility in the matter, and to that of our County Councils, that they are doing their duty towards the higher education and science in particular. But I have grave doubts if the best is being done by private enterprise, which in all matters of progress is a characteristically British method of procedure in the higher walks of life. How many of us, competent to aid in the local management and organisation of museums and scientific institutes, are doing all that we might to keep those in charge of them on the right path. One still finds exhibited the *omnium gatherum* of scraps, the product of nature overshadowed by the artifice of man. In place of the representative collection of objects of local interest, of specimens and maps which should furnish a key to the physical constitution of the neighbourhood, and which a visitor has a right to expect on entering a strange land, one too often finds the rumble-jumble of odds and ends, with here and there a hidden treasure. There is a so-called "museum" not many miles from this place, in which payment is extracted from the visitor to behold, as a conspicuous exhibit amidst a collection of oddments, a milk tin recovered from the *Fram*, which Nansen would himself probably disown! Local control and organisation should render this sort of thing impossible, despite its being due to "private enterprise," and you must please pardon me when I draw attention to the fact that we in the south are behind our northern brethren in respect to local organisation for science and the higher education. I can conceive no better outcome of this meeting than that we should at once resolve, by connected action, to put this right.

On appeal to a frivolous public, we are told there is nothing to come of it, that work of the kind to which we aspire is not remunerative, and that the cultivation of scientific tastes is to be avoided, as narrowing in effect and tending to dwarf the religious instinct, and foster doubt. To this I would reply (1) that most of our boasted advantages in civilisation have been due to the outcome and the application of science to daily life and domestic use; (2) that there is no better tonic for the human mind than that afforded by perusal of the works of nature; (3) that the existence of matter, "motion, and law-abiding operation in nature, are greater miracles than were ever recounted by the mythologies"; and (4) that science, with love, now rules the world.

To counteract the tendency of our time, it is for us to see to it that the selection and arrangement of the exhibits in our museum collections shall furnish the visitor with a series of local object lessons, both attractive and instructive, and so ordained as to create in the mind of the mere passer-by—as can readily be done by the excellent system of descriptive labelling now coming into vogue—a desire to know more of his immediate surroundings, and, through them, of his position and relationships as a dweller in the neighbourhood and a factor in the universe at large.

The aim and object of not a few of our local scientific societies would seem to be publication rather than this, and against the tendency I would urge every influence I can command. If confined to mere local records of fact, *Proceedings* or other publications, maintained in moderation, are well and good, but, with larger and central institutions given to the meeting of persons from various localities for comparison of local forms and discussion of broad principles, the local society, in striving after this, is exceeding the bounds of reasonable distribution of labour.

Once again let me remark that we can have no higher object in view than the capture of youth. Huxley has wisely said:—

"The great end of life is not knowledge, but action. A small percentage of the population is born with special aptitude of some sort or another; and the most important object of all educational schemes is to catch these exceptional people, and turn them to account for the good of society . . . and to put them into the position in which they can do the work for which they are specially fitted."

And he added:—

"That if the nation could purchase a potential Watt, a Davy, or Faraday, at the cost of 100,000*l.* down, he would be cheap at the money."

To me nothing would be more gratifying than that there might result from this meeting an agreement upon a line of action which might track a genius and place him on the ladder he was born to ascend, to the permanent glory of his race and benefit of the world at large.

In these days, when bombast and self-assertiveness are apt to be mistaken for executive power, we want all the originality we can secure. Learning is but our knowledge of the experience of others, knowledge our very own! Higher ambition than that of adding to the sum of knowledge no man can have; wealth, influence, position, all fade before it, but we must die for it if our work is to live after us.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

A COURSE of lectures and demonstrations in practical hygiene for teachers will be held partly at Bedford College and partly at the Sanitary Institute, on Saturday mornings during the three terms of the present year.

WE learn from *Science* that Mr. John D. Rockefeller has made a further gift of 1,500,000 dollars to the University of Chicago. Of this sum, 1,000,000 dollars is to be used as an endowment fund. The balance of the gift is to be used for general needs. Mr. Rockefeller suggests that 100,000 dollars be used for the construction of a university press building. Mr. Leon Mandel has given 25,000 dollars to the University, in addition to his previous gifts.

ONE of the most important developments recorded in the recent report of the Somerset County Education Committee is the presentation, by Lord Portman, of an experimental farm, five miles from Taunton. The farm consists of 142 acres, of which 80 are pasture. Lord Portman has made considerable alterations and additions to the farm buildings in order to bring them up to date and to adapt them to the requirements of the County Committee. The primary object of the farm will be experiments on the profitable feeding of farm animals of various

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kinds. Incidentally there will be considerable opportunity for experiments in the improvement of land and the best methods of growing various crops.

ANNOUNCEMENT is made in the *British Medical Journal* that the rich family of Mitsui of Tokio has offered an extensive site in that city for the erection of a University for women, and three other citizens have between them contributed a sum of 24,000*l.* for the cost of the necessary buildings. The work is already in progress, and it is hoped that the new University will be opened in the spring of 1901. It is not likely that there will be any want of students, as in recent years very many young ladies of good family have applied to be admitted to the University courses, especially to the faculty of medicine and the Polytechnic School. The latter institution is intended for the training of civil engineers, a circumstance which seems to show that Japan is about to set an example to Europe in opening up a new sphere of labour for the women of the future.

THE new Calendar of University College, London, announces several developments for the present year. There will be a course of work in experimental psychology, and an elementary course of physiological demonstrations on the nervous system and the sense-organs. A complete installation for the production of liquid air has recently been presented to the College, and facilities are offered for research at low temperatures. Instruction is given in spectroscopy, which forms a subdepartment to chemistry, and is equipped for practical work in spectrum analysis and spectrum photography. A special course on the morphology of the Sporangium has been arranged, and subdepartments in physiological chemistry and histology have been established. The Calendar contains an important speech delivered by Lord Reay, president of the College, on the development of the University of London; and lists of original publications by members of the Faculties of Arts, Laws and of Science.

SCIENTIFIC SERIAL.

American Journal of Science, December, 1900.—Torsional magneto-striction in strong transverse fields, by C. Barus. The effect of longitudinal magnetisation is an increment of rigidity in all paramagnetic metals, whereas the permanent effect of a transverse or a circular field is relatively inappreciable so far as rigidity is concerned.—Notes on tellurides from Colorado, by C. Palache. The minerals described include sylvanite from Cripple Creek and two well-developed Hessite crystals from Boulder County.—New species of *Merycochoerus* in Montana, by Earl Douglass. The new species is called *Merycochoerus laticeps*. It has a low skull, broad behind the orbits, and narrowing rapidly towards the front and back. Brain case short, the length behind the post-frontal process being about one-half the distance in front of it. Premaxillaries united in front, forming a trough-shaped depression, evidently for the accommodation of a proboscis. Maxillaries deeply concave on the sides of the face. This, with the malo-maxillary ridge, which widens outward rapidly towards the zygomatic arch, forms a broad and nearly horizontal shelf above the posterior premolars and anterior molars.—Mohawkite, stibio-domeykite, domeykite, algodonite, and some artificial copper arsenides, by G. A. Koenig. In the Keeweenaw copper formation, the arsenides are not found in the bedded deposits of native copper, but always in fissures, intersecting the beds. The veins have thus far only been observed in the lower beds, near the foot of the formation to the southeast. Arsenic, however, is found in the smelted and refined copper of all the mines. The author describes the physical and chemical constitution of the minerals named.—Heat of solution of resorcinol in ethyl alcohol, by C. L. Speyers and C. R. Rosell. Since heat is rejected when resorcinol dissolves in a large excess of ethyl alcohol, and since heat is absorbed when it dissolves in a small quantity, the temperature should not change when these substances are mixed in some certain proportion. This proportion is found to be about six grammes of resorcinol to about 100 grams of ethyl alcohol.—The sulphocyanides of copper and silver in gravimetric analysis, by R. G. van Name. The estimation of sulphocyanides by precipitation with silver nitrate and direct weighing of the precipitate is wholly permissible. The method is extremely simple, and the results are quite accurate.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 6, 1900.—"On the 'Blaze Currents' of the Frog's Eyeball." By Dr. A. D. Waller, F.R.S.

The author demonstrated by experiment on the frog's eyeball the responses to electrical stimuli, which he terms "blaze currents." He gave an account of his work, which is briefly summarised in the following statements. The normal electrical response to light and to every kind of stimuli is positive, *i.e.*, from fundus to cornea; it is partly retinal, partly by other tissues, it is reversed by pressure. "Blaze currents" are responses to electrical stimuli, and are comparable with the normal discharge of an electrical organ amounting to 0·03 volt. "Blaze currents" manifest summation of stimuli and effects, staircase increase and fatigue decline. The energy of a blaze effect may considerably exceed the energy of the exciting cause. An eyeball will show blaze currents during five days after excision, they diminish under prolonged illumination, and increase under prolonged darkness. The influence of increased temperature and pressure is studied, and under the latter four types of response are recorded.

If single electrical currents are passed through a normal eyeball and a galvanometer in a homodrome and in a heterodrome direction, *i.e.*, with and against the direction of normal discharge, the homodrome (positive) deflection is greater than the heterodrome (negative) deflection.

EDINBURGH.

Royal Society, December 3, 1900.—The Rev. Prof. Duns in the chair.—Dr. R. J. A. Berry read a paper on the true cæcal apex, or the vermiform appendix—its minute and comparative anatomy. The object of the microscopical investigation was to see what, if any, analogies exist between the true apex of the cæcum in the lower animals and its equivalent, the vermiform appendage, in man. Three types were selected, the rabbit, the cat and the pigeon; and in these there is a marked accumulation of lymphoid tissue at the true cæcal apex, the accumulation reaching its maximum development within a week after birth. These developments were illustrated by numerous lantern slides; and from them, combined with a comparison of the corresponding arrangements in other animals, it was concluded that lymphoid tissue is the characteristic feature of the cæcal apex, the vermiform appendix in man being represented in the vertebrate kingdom by a mass of lymphoid tissue, situated most frequently at the cæcal apex; that, as the vertebral scale is ascended, this lymphoid tissue tends to be collected into a specially differentiated portion of the intestinal canal—the vermiform appendix; and that this appendix in man is not, therefore, a vestigial structure, but is a specialised part of the alimentary canal. Dr. Thomas Muir communicated two papers, (1) Some identities connected with alternates and with elliptic functions; (2) A peculiar set of linear equations, the latter being an interesting case of bi-rational transformation.

Dec. 17.—Lord Kelvin, President, in the chair.—The chairman made a communication on the transmission of force, the main conclusions being that the æther itself could not be subject to gravitation, the supposition involving instability, and that although electric and magnetic force could be explained mechanically in terms of points which acted as sources and sinks of æther flow, no explanation had hitherto been given of gravitational force. We seemed to be compelled to fall back upon the simple assumption that gravitational action was an inseparable attribute of the atoms of matter, that it was a fundamental fact behind which it was impossible to get. Mr. C. Tweedie, M.A., in a note on Dr. Muir's paper on a peculiar set of linear equations, read at last meeting, gave a simpler demonstration of a general theorem suggested in that paper. Prof. J. T. Morrison (Stellenbosch) communicated a paper (date Nov. 6) on a suggested solar oscillation, with some of its possible astronomical and meteorological consequences; together with a generalisation as to the constitution of matter and the cause of gravitation. The sun was supposed to be subject to a pulsation of twenty-two years' period with reference to an axis nearly coincident with the axis of rotation; and on this assumption, for which cosmical causes might be plausibly suggested, the sun-spots occurring in the regions of greatest surface displacement received a ready explanation. Variations of temperature accompanying the expansion and contraction of the sun would produce a corresponding periodicity in the vertical projection of

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